**U.S. Army Research Institute
for the Behavioral and Social Sciences**

Research Report 1759

The Commanders' Integrated Training Tool for the Close Combat Tactical Trainer – 2: Second Generation Design and Prototype Development

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14. ABSTRACT *(Maximum 200 words)*:

This report describes the continued design and prototype development of the Commanders' Integrated Training Tool (CITT) for the Close Combat Tactical Trainer (CCTT), a system of armored vehicle manned-module simulators and workstations that allows units to train collective armor and infantry tasks at the platoon through battalion task force level. This project was a follow-on to the initial CITT project completed in January, 1999 which produced the design and a prototype software application and Web Site to provide unit commanders and other unit trainers with comprehensive information on CCTT and on structured training along with the ability to produce exercise Training Support Packages. The current project expanded the CITT design and prototype to include additional terrain databases, information and exercises for Force XXI Battle Command Brigade and Below (FBCB2) units, and the integration of CITT with the CCTT Exercise Initialization Tool (CEIT). Near-, mid-, and long-term implementation strategies and fielding plans were developed and are presented along with lessons learned and recommendations for future actions.

15. SUBJECT TERMS

Training	Commanders' Integrated Training Tool (CITT)	Combined Arms Tactical Trainer (CATT)
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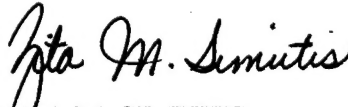| Army Project Number	Personnel Performance
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FOREWORD

The use of simulations in U.S. Army training continues to increase, as does the need for tools and techniques for exploiting simulation training capabilities. For the past several years the U.S. Army Research Institute for the Behavioral and Social Sciences has been a leader in the development of structured training approaches providing such tools and techniques, primarily through work accomplished in the Armored Forces Research Unit (AFRU) at Fort Knox, Kentucky. Experience with structured simulation-based training has led to the recognition of a need to provide a comprehensive system to "train the trainer." The Close Combat Tactical Trainer (CCTT) magnifies this need since an experienced full-time training team is not provided to conduct training. Commanders and other trainers need to understand the capabilities of the CCTT, and to be able to tailor structured training to maximize the benefit of the CCTT in their unit training strategy.

This report describes the design, prototype development, formative evaluation, and refinement of the second generation of a computer software package that helps commanders and other unit trainers to develop and manage structured training in the CCTT. This effort was entitled "Commanders' Integrated Training Tool – 2 (CITT-2)," building upon an earlier AFRU project which led to development of the initial version of the CITT. The AFRU accomplished the CITT-2 effort as part of Work Package 205, "Assessment of Force XXI Training Tools and Techniques." The relevant requirements document is a Memorandum for Record between the Chief, AFRU and the Project Manager for the Combined Arms Tactical Trainer (PM CATT), entitled "Structured Training for the Close Combat Tactical Trainer," dated 25 July 1997.

The CITT-2 software design and prototype software package were briefed to representatives of the U.S. Army Training Support Center, the PM CATT, and the Training and Doctrine Command System Manager for CATT on 21 January 00. The second-generation software package is available in standalone and Web-based versions and has been provided to CCTT sites and other selected locations. This report documents the methods and lessons learned in the second round of CITT design, and in developing and formatively evaluating the second-generation prototype. It will be useful to individuals and agencies involved in the development and implementation of Army training development and management systems for live, virtual, or constructive training environments.

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Technical Director

ACKNOWLEDGEMENTS

THE COMMANDERS' INTEGRATED TRAINING TOOL FOR THE CLOSE COMBAT
TACTICAL TRAINER – 2: SECOND GENERATION DESIGN AND PROTOTYPE
DEVELOPMENT

EXECUTIVE SUMMARY

Research Requirement:

The U.S. Army is currently fielding the Close Combat Tactical Trainer (CCTT) as the
first member of the Combined Arms Tactical Trainer family. The CCTT provides a virtual
environment supporting the collective training of armored and mechanized infantry units. To
maximize its effectiveness, the CCTT will be fielded as a complete, integrated training system,
i.e., in addition to the basic hardware and software that comprise the system, it will also provide
the tools required to enable its users to achieve maximum benefit from its use. As CCTT
training tools, techniques, and procedures have evolved, the need has increased for integrating
them so that commanders and other unit trainers can access and use them readily and effectively.
Such an integrating system or tool should: (a) provide trainers with ready access to all the
information and methods they need to exploit the emerging capabilities of CCTT; (b) be
compatible with Army training management information systems and databases; (c) lead users to
effective and efficient methods for developing and implementing training by providing ready
access to available exercises, associated Training Support Packages (TSPs) and other materials;
(d) provide users with an understanding of and means to apply a structured approach to meeting
training requirements; and (e) address the training of digital forces.

From October, 1997 to January, 1999 a project to research and develop the Commanders
Integrated Training Tool (CITT) for the CCTT, a tool having the characteristics described above,
was completed. This project resulted in the design and development of the CITT. The design
was presented in the form of Integrated Definition (IDEF) models and Node Tree Diagrams; the
prototype was delivered as a desktop software application, a Web Site, and two information
videos. As the project was being completed, several new research and development (R&D)
requirements were identified including the need to address more than one terrain database
(TDB), the need to include requirements for Force XXI Battle Command Brigade and Below
(FBCB2) equipped units, and the need to integrate the CCTT Exercise Initialization Tool (CEIT)
into CITT. These were addressed in the present project.

Procedure:

The project objectives were accomplished through the completion of six major activities.
During the first month of the project, a comprehensive R&D plan was produced and provided to
the project Contracting Officer's Representative for approval. Upon approval, development of
the expanded CITT design was initiated. Design activities were accomplished using U.S. Army
approved methodologies, such as IDEF modeling. Concurrently with CITT design, a second-
generation prototype CITT was developed. Development occurred in two phases–development
and fielding of a refined CITT to support formative evaluation (FE) and development of the
second-generation prototype CITT based on requirements stated in the R&D plan and on the

results of FE. Development occurred using the same methodologies as had been employed in the original CITT project. The FE was accomplished through a combination of internal testing, and assessment of CITT using personnel from several Active Component units. Refinement and expansion of the implementation strategy and fielding plan for the CITT was accomplished by developing near-, mid-, and long-term plans which take into account current and anticipated Army requirements and changes in technology. The final activities of the project involved documentation of project activities, lessons learned, and recommendations relating to implementation and fielding.

Findings:

The CITT design was completed and documented from the standpoint of the unit trainer as the CITT "To-Be" design and is documented as a separate U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) Research Note (Dannemiller & Gossman, in preparation). The design addresses a "future" CITT software application modeled from the viewpoint of the unit commander/trainer. A prototype CITT desktop application and a CITT Web Site were also developed. The prototype CITT 2.0 was fielded at a limited number of locations in April 2000. The CITT Web Site is currently operational. The design, prototype CITT, and the Web Site address the expansion of CITT as described in the CITT Statement of Work (ARI, 1999) including additional TDBs, FBCB2-equipped units, and the CEIT/CITT interface. Implementation strategies and fielding plans for near-, mid-, and long-term were developed, and lessons learned were documented.

Utilization of Findings:

The specific audiences who will find the information contained in this report beneficial include: (a) designers and developers who continue further development of the CITT, (b) training unit and CCTT training site personnel, (c) simulation system developers, and (d) any member of the U.S. Army who wants to better understand the TSP development process. The CITT design is fully documented and can be used as the basis for the development of an integrated training tool under any of several fielding alternatives developed as part of the project.

THE COMMANDERS' INTEGRATED TRAINING TOOL FOR THE CLOSE COMBAT
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Introduction

Beginning in October 1997, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI)[1] Armored Forces Research Unit (AFRU) at Fort Knox, Kentucky, sponsored a project to develop the Commanders' Integrated Training Tool (CITT) for the Close Combat Tactical Trainer (CCTT). The CCTT is a virtual training system that supports the training of collective tasks for armored and mechanized infantry units, including combat support and combat service support, at the platoon and company/team level. It includes the capability to support battalion task force (and perhaps brigade) training as command field exercises or as portions of larger integrated exercises. For training in CCTT to be maximally effective, it must incorporate the "Train as You Fight" doctrine of FM 25-100 (Department of the Army, 1988) and FM-25-101 (Department of the Army, 1990) and follow the principles of structured training that have been developed over the past several years (Campbell, Campbell, Sanders, Flynn & Myers, 1995; Bessemer & Myers, 1998; Wilkinson, in preparation). Indeed, over 60 structured training exercises have been developed by contractor teams working primarily at Fort Knox under the sponsorship of ARI (Flynn, Campbell, Myers, and Burnside, 1998, Deatz et al., 1998). These exercises and their related training support packages (TSPs) provide the core set of exercises around which CCTT training and testing have been conducted.

The CITT project (Gossman et al., 1999) provided a detailed design and prototype for a tool that allows commanders and other unit trainers to tailor the training their unit will conduct in CCTT to their specific unit needs. This is accomplished by allowing commanders and other trainers to select from existing exercises if such exercises match their training needs; by modifying an existing exercise to more closely match their training needs; or by creating an entirely new exercise that matches their training needs. In addition, the CITT provides extensive information on the CCTT and on developing structured training exercises. It is, in effect, a comprehensive source of information needed by users to participate effectively and efficiently in CCTT training. It is also a TSP authoring tool.

At the conclusion of the CITT project, a number of recommendations for improvement to the CITT, both the design and prototype, were included in the final report. For example, formative evaluation (FE) data indicated that the TSP authoring process was overly complex, and the graphical user interface (GUI) employed in the prototype was somewhat cumbersome. In addition, a number of new requirements for the CITT had been identified by ARI in the CITT-2 Statement of Work ([SOW] ARI, 1999). Specifically, there was a need to incorporate support for the CCTT capability to train Force XXI Battle Command Brigade and Below (FBCB2) equipped units; there was a need to add the Temperate Forest (Primary 1 [P1]) and Fort Hood (P3) TDBs to the CITT; and there was a need to examine and design effective and efficient means for an interface between CITT users and CCTT site personnel.

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[1] A list of all acronyms used in the report is included in Appendix A.

In January 1999, ARI AFRU initiated a project to expand and enhance the CITT design and to produce a second-generation prototype CITT which would incorporate the recommendations from the initial CITT project as well as the additional requirements specified above. This project was designated the Commanders' Integrated Training Tool for the Close Combat Tactical Trainer – 2 (CITT-2) and is the subject of this research report.

Purpose of the Report

The purpose of this report is to describe the research methods and outcomes of the project to produce the design for an expanded CITT and to develop a second-generation CITT prototype in stand-alone and distributed forms. Additional project activities and objectives will be described, such as enhancements to the CCTT Instructional Overview (IO), the incorporation of expanded help and tutorial files into the CITT, the conduct of FE in support of design and prototype development, and lessons learned that can be applied to similar projects.

Organization of the Report

This report is organized as follows:

1. The Project Background and Need section describes the need for the expanded and enhanced CITT and the overall purpose of the project including a statement of the project objectives.

2. The Research Methodology section describes the activities that were completed and the methods that were employed to achieve the project objectives. The first section focuses on the design of the enhanced CITT; this is followed by a description of the development of the second-generation CITT prototype (Versions 1.1 and 2.0) including the expanded IO and help functions; the next section focuses on the FE conducted to support prototype development; and the final section describes the activities involved in development of the near-, mid-, and long-term implementation strategy and fielding plans.

3. The Results section focuses on the products and findings of the project. Its organization mirrors the Research Methodology section and describes the outcomes of the design, development, and FE activities. It also describes the implementation strategy and fielding plan for the CITT.

4. The Lessons Learned section describes findings from the project that are relevant to future design and development efforts.

5. The Summary and Recommendations section provides a brief synopsis of the report and presents a number of recommendations for future efforts.

Project Background and Need

With the successful completion of the CITT project, there was a need to update and expand the CITT design and the CITT prototype both as a result of findings from the initial CITT project and as a result of new developments in CCTT and related technology. A list of 33 findings and recommendations for improvements to the CITT was included in the CITT final

report (Gossman et al., 1999) in addition to the general findings cited previously that the user interface was cumbersome and the TSP development process was somewhat confusing. There was a need to address these.

External to the CITT project and findings, a number of additional developments had occurred or were occurring that further emphasized the need to expand and enhance the CITT. For example, the initial development of training methods and tools for the CCTT (including CITT) focused on the training of conventional forces. Recently, capabilities for training digital[2] (FBCB2) units have been incorporated into the CCTT through the CCTT XXI initiative. The CITT design and prototype required expansion to address these capabilities fully, drawing from relevant initiatives such as the ARI ARFU effort entitled "Training for the Digital Battlefield" (Dierksmeier et al., 1999) and an ongoing effort to develop FBCB2 TSPs for CCTT under the Force XXI Training Program at Fort Knox. As another example of needed CITT expansion, initial CCTT TSPs, CITT design, and the CITT prototype focused on the National Training Center (P2) TDB initially available in CCTT. The Temperate Forest (P1) and Fort Hood (P3) TDBs were becoming available, and CITT needed to be expanded to support development of TSPs for exercises on them.

Based on these needs, ARI issued a SOW for the Commanders' Integrated Training Tool for the Close Combat Tactical Trainer – 2 (CITT-2) project. The stated purpose of the project was to update and expand CITT to support commanders and other unit trainers in exploiting fully the capabilities of CCTT for training conventional and digital forces. The CITT-2 project was to sustain the initial CITT focus at the company team and platoon levels as well as continuing design and development within a brigade training context addressing the fit of CCTT in a global training strategy in order to provide an appropriate tactical training framework and to support possible further expansion. The project was to result in an expanded CITT describing fully and facilitating the implementation of:

1. The current and emerging capabilities of CCTT to train conventional and FBCB2-equipped units;

2. The methods (including cognitive aspects–the "why" as well as the "how") of applying the structured training principles and approach to developing and implementing training in CCTT; and

3. The tools, techniques, and procedures for training efficiently and effectively with CCTT.

This overall purpose was to be accomplished through the achievement of five project objectives:

1. To update and expand the initial design for the CITT in stand-alone and distributed versions including digital (FBCB2) training capabilities of the CCTT, the inclusion of multiple TDBs, and the CITT user–CCTT site interface.

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[2] Note: for convenience the terms "digital unit" and "FBCB2-equipped unit" are used interchangeably in this report.

2. To develop a second-generation prototype CITT in stand-alone and distributed versions incorporating the updated and expanded design to the extent possible.

3. To refine the second-generation prototype CITT and design documentation, based on the conduct of FE, by providing support for and monitoring limited implementation focusing on the stand-alone version.

4. To refine and expand the implementation strategy and fielding plan/methods for the CITT.

5. To document results of second-generation CITT design and development including lessons learned and recommendations relating to further implementation and expansion of the CITT.

The CITT Team produced a response to the SOW in the form of a Research Program Plan (CITT Team, 1999d), which described, in detail, the methodology for accomplishing these objectives.

Research Methodology

This section focuses on the process and activities through which the project goals and objectives were achieved including describing the research methods employed to obtain and analyze data as well as the key decisions that were made based on the data collected and analyzed. Figure 1 shows the project schedule for completion of the activities described in this section.
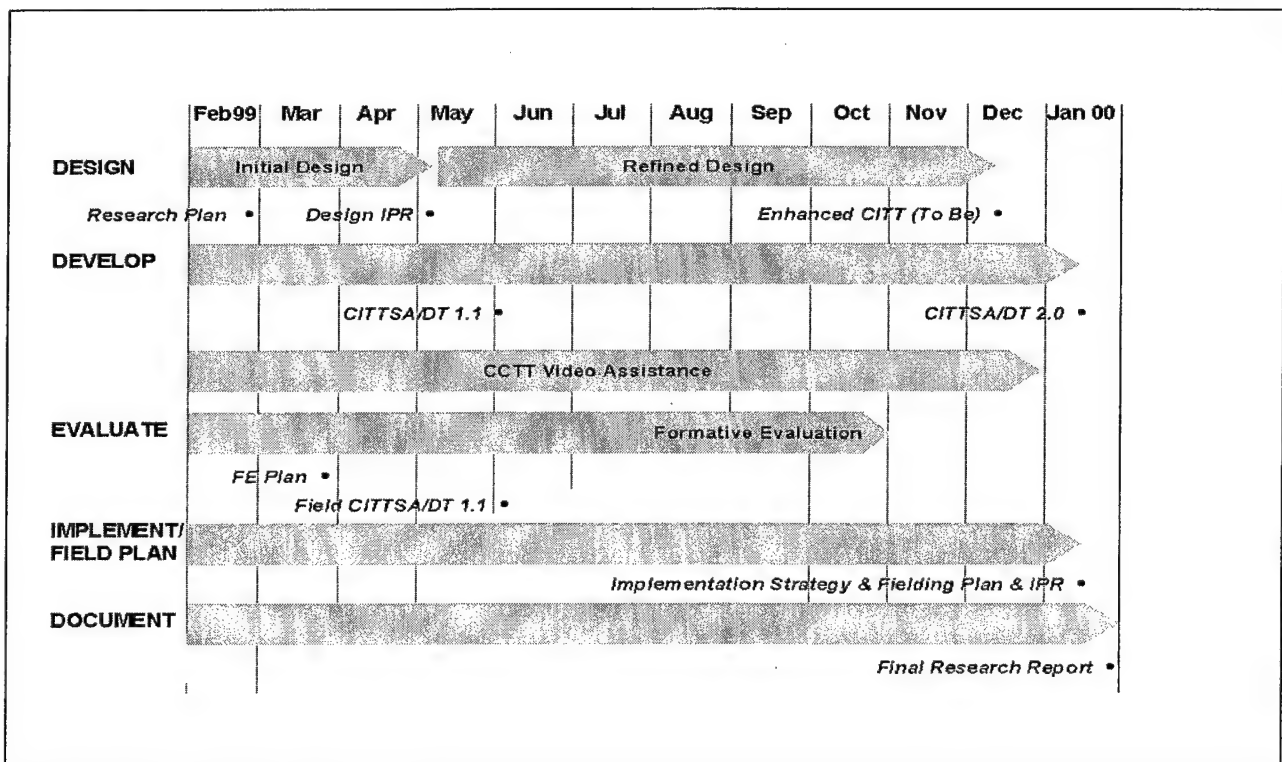
Figure 1. CITT-2 project timeline.

Design the Enhanced CITT

Using lessons learned from the original CITT research and development (R&D) project as well as technological advances that had occurred since the development of the CITT Stand-alone 1.0, the CITT Team expanded the design of the CITT for the CCTT. Initial design enhancements were intended to represent the CITT 1.1 prototype (see below). This included the addition of information, data, and forms required for FBCB2-equipped units, multiple TDBs, the CITT user–CCTT site interface, and the expanded IO. The methodology employed was essentially the same as that used in the CITT project. Members of the team collected and analyzed information regarding proposed enhancements including how the enhancements would be incorporated into the CITT design. The team also worked closely with a contractor team which was working on a Program Manager-Combined Arms Tactical Trainer (PM-CATT) funded project to develop the CCTT Exercise Initialization Tool (CEIT). During the initial CITT project, the team had worked with this contractor group which, at that time, was developing a map and overlay tool for use in developing CCTT exercises. This tool was incorporated into CITT 1.0. As a follow-on to the map and overlay tool project, contractors from Lockheed-Martin and AcuSoft (hereafter called the CEIT development team) were tasked with developing CEIT which includes enhanced map and overlay tools as well as the ability to generate a CCTT exercise initialization file from the maps and overlays produced. This initialization file provides a significant component of the CITT user–CCTT site interface.

Using Department of Defense and Department of the Army (DA) approved methodology for Integrated Definition (IDEF) modeling (DA, 1997; U.S. Department of Commerce, 1993), the design was completed and documented using the following:

1. IDEF0–used to produce a function or activity model that is a structured representation of the expanded CITT functions.

2. IDEF1X–used to document the modifications to the relational database schema of the expanded CITT. The IDEF1X models are applicable only for the initial design.

3. IDEF3 and Data Flow Diagram–used to capture descriptions of activity sequences and details of the function or activity model.

The initial design was briefed by the CITT team during an in-process review conducted in May 1999 and was approved by the Contracting Officer's Representative (COR) and other interested parties.

Development of the expanded CITT design continued for the remainder of the project with much of the work centering around the inclusion of the CEIT into the design. The CITT team worked closely with the CEIT development team to identify and define how CEIT and CITT interact and how CEIT could be incorporated into the expanded CITT. Additionally, enhanced design included deriving user and system requirements, identification of key issues and functions/activities of the expanded CITT, determining new and/or additional interfaces, and allocation of architecture requirements to system elements.

Develop Second-Generation CITT Prototype

As shown in Figure 1, the second-generation CITT Prototype development consisted of two separate phases: development of an enhanced second-generation CITT for limited fielding to support FE; and development of a refined second-generation CITT, based on the results of FE, for implementation and fielding at the conclusion of the project. (For the remainder of this report, the enhanced second-generation CITT will be referred to as the CITT 1.1, and the refined second-generation CITT will be referred to as CITT 2.0.)

CITT 1.1

The CITT-2 SOW specified that, at a minimum, the CITT 1.1 would provide commanders and other unit trainers with the capabilities to access, modify, or develop CCTT exercises on the P1, P2, and P3 TDBs for conventional and FBCB2-equipped platoons and company teams. The CITT 1.0 (the final product of the CITT project) had addressed only the P2 TDB and did not address FBCB2 at all.

To address FBCB2, the team was required to collect and analyze data on its operation and capabilities in CCTT and, from this, to determine what was appropriate to include in CITT. Data were collected from three primary sources. First, the team obtained and reviewed FBCB2-related documentation (TRW Systems and Information Technology Group, 1998; DA, 1998). Second, a copy of the FBCB2 software (Version 2.0 Beta) was installed on a local computer allowing members of the team to analyze its operation including message flow, data transfer, etc. Third, two members of the team observed the FBCB2 limited user test at the Fort Hood CCTT site which allowed them to obtain data on how units actually used the system while running CCTT exercises.

Data collected from the various sources were synthesized to determine their impact on the CCTT TSP content, structure, and format developed during the Structured Training for Units in the Close Combat Tactical Trainer projects (Flynn, Campbell, Myers, and Burnside, 1998; Deatz et al., 1998). In addition, one member of the team was temporarily assigned to assist in the development of two structured training TSPs for FBCB2-equipped units, and the information from this experience facilitated the process of determining the data needed in the TSP. Once TSP additions/modifications were identified, an analysis was completed to determine which should be supported by or included in the CITT 1.1.

The inclusion of alternate TDBs was approached from the standpoint of adding the maps that were available at the time in order to support limited fielding of CITT 1.1 in early June 1999. Six scanned images depicting the lower right section of the P1 TDB were obtained from U.S. Army Simulation, Training, and Information Command (STRICOM) and were combined to form a single graphic image which was then incorporated into the CITT application. In order to use this map, a function to select the P1 or P2 TDB was added to the PowerPoint map and overlay tools that had been included in CITT 1.0. In addition, the source code for the map and overlay tools was modified to eliminate a problem with scaling of graphic images when the user changed TDBs. The programming necessary to accomplish both was completed prior to fielding of the CITT 1.1. As a test of the operation of the P1 map and its incorporation into CITT 1.1,

two CCTT exercise TSPs were developed by converting exercises based on the P2 TDB to the P1 TDB.

No attempt was made to incorporate the P3 TDB or the other sections of the P2 TDB into CITT 1.1. This decision was made based on information from the CEIT development team that the PM-CATT was in the process of converting all terrain maps into digitized plan view displays (PVDs) consistent with those used in CCTT. The team decided to delay adding additional terrain maps until the PVDs were available.

Following completion of data collection and analysis, the CITT application was modified. The changes to the TSP necessary to support CCTT training of digital units were incorporated by revising existing tables, forms, and queries; five Mission Training Plans (MTPs) needed to support training of digital units were added to the existing database; Help files were updated to reflect the modification made to the CITT; and the IO was updated to include FBCB2 and P1 TDB information. Throughout the modification process, the CITT was tested by members of the development team. This testing consisted of exercising the application to determine if it would "break," i.e., if it would produce errors in the Access database or in the TSP authoring process. All errors discovered were entered into a Census 97 database which had been set up to track errors.

Two short booklets were produced (CITT Team, 1999b, 1999c). These contained basic information to assist CITT administrators and users in installing CITT should that be necessary and in using CITT, particularly users unfamiliar with using Microsoft Access-based applications. At this point, the CITT 1.1 underwent limited fielding to support FE as described below.

CITT 2.0

Work on CITT 2.0 began with the identification of several goals that the team wanted to achieve. First, the enhanced CITT 2.0 would incorporate findings from the FE of previous CITT systems 1.0 and 1.1. Second, CITT 2.0 would include a simplified user interface and a simplified TSP development/authoring process. And finally, it would incorporate more military terminology rather than the simulation and CCTT terminology that had been used in earlier versions. For the remainder of 2.0 development, these goals became constraints in that proposed modifications and additions to CITT were continuously evaluated in terms of meeting them.

Two primary data sources were initially examined to identify requirements for the CITT 2.0. The final report for CITT had identified 33 recommendations for improvement to CITT, and internal testing of CITT 1.1 had identified 15 defects and/or modifications that had been deferred to CITT 2.0. These 48 modifications/improvements were analyzed and classified into two categories: those that could be incorporated with little difficulty and those that could be incorporated, but with greater difficulty. They were prioritized according to their criticality for inclusion into 2.0. Based on these analyses, a list of development tasks for producing CITT 2.0 was developed, and a timeline for accomplishing them was produced. These were presented to the COR, and, based on his comments and recommendations, a final list and timeline were produced.

At this point in the project, the requirement to coordinate with the CEIT project was elaborated further. The CEIT is a major extension of the map and overlay tools that had been included in CITT 1.0. In addition to providing the mapping tools in an enhanced version, CEIT is intended to "interpret" information on the map (e.g., unit locations, unit types, opposing forces [OPFOR] and blue forces units and locations, environmental data, etc.) and produce an American Standard Code for Information Interchange file which can be used to initialize an exercise at a CCTT site. The CEIT provides a valuable link between the unit trainer who is developing an exercise using CITT and the CCTT site staff who will manage and run the exercise at the site.

The CEIT had several significant impacts on 2.0 development. Its most immediate impact was the additional time required by the team to gather and analyze data on CEIT and how it operates. This was necessary to make timely decisions on how best to approach incorporation of CEIT and how to coordinate with the CEIT development team. Once initial decisions were made, incorporation of CEIT became an ongoing requirement of the project similar to other identified requirements. The major difference between CEIT and other project requirements was the much higher level of coordination required between the two projects due to the fact that both projects were ongoing and there was a high degree of interdependence between them.

The CEIT/CITT coordination occurred continuously from the time the requirement to integrate CEIT into CITT was specified. Information was shared on an almost daily basis via e-mail and telephone communications. In addition, four site visits occurred: two occasions on which CITT team members visited the CEIT team in Orlando; and two occasions on with CEIT team members visited the CITT team at Fort Knox. These meetings occurred in April, July, and August 1999, and January 2000. In the interim, numerous conference calls were held to ensure ongoing coordination. This level of coordination was effective in achieving the degree of integration of CEIT into CITT that occurred; however, integration was always limited by the fact that the end date for CEIT was three months after the end date for CITT-2.

CEIT integration required the identification of common data elements, i.e., data included in both the CEIT and CITT databases; specifically the data that CEIT takes from the maps and overlays produced using the CEIT embedded in CITT and converts to the exercise initialization file that is loaded into CCTT. Close coordination allowed the two teams to identify elements used by both CEIT and CITT and to devise a process for making the data available to both applications. The process involved the creation of a "shared database." The shared database consists of such data elements as unit identification, starting locations, environment, and unit frequencies and radio nets, and is essentially a buffer that stores these data elements as they are generated by CEIT and can then be "read" by CITT and used to populate the appropriate CITT tables. In so doing, these data become part of the TSP without requiring additional input on the part of the CITT user.

Once the analysis of CITT 2.0 requirements, including CEIT, was substantially complete, work on prototype development of 2.0 was initiated. "Mock-up" screen shots were developed for the complete CITT process. After an internal review and modification, revised screen shots were developed and presented to a focus group comprised of representatives from the military, CCTT site personnel, and other stakeholder organizations. This focus group was similar to the user jury that had been used in the original CITT project; however, based on findings from the CITT project, the review process was conducted somewhat differently. First, there were fewer

meetings of the group; however, meetings were substantially longer (three to four hours versus one hour) and more focused. The meetings had fixed agendas, and the group facilitator generally kept the group focused. This allowed the group adequate time to consider and discuss the information presented. Second, the CITT team provided the group with specific input on both the TSP development process and the proposed GUI which further helped focus discussion. The outcome of the focus group meetings was a list of proposed modifications to the CITT (see below for more detail), including renaming graphics, adding task conditions and standards, adding a "Why" button feature to address the cognitive aspects of structured training development, and clarification of the functional hierarchy of mission/exercise/tasks.

Based on input from the focus group and continuing data collection and analysis including data from the PM-CATT, final mock-ups of screen shots portraying the TSP development process and GUI were produced and a timeline and process for 2.0 prototype development was established. This process consisted of the following steps:

1. Modify the underlying CITT database tables and structure.

2. Build screens and queries using Microsoft Access.

3. Modify/develop Help screens and the IO and develop "Why?" screens and tutorials.

4. Integrate CEIT.

5. Re-enter all TSPs in CITT 1.1 in order to produce the exercise initialization file.

6. Conduct internal testing.

7. Field CITT 2.0.

Development of CITT 2.0 generally followed this process, although, as would be anticipated, there was some overlap among the activities. In addition, it was possible to segment at least part of the development along functional lines. That is, once modifications to the basic database were complete, the remaining activities could be completed for the "Create" function, then for the "Modify" function, etc. The need for "Why?" screens and the tutorials referred to in step 3 had come out of the focus group discussions as well as FE of earlier versions. The team completed the data collection and analysis necessary to determine how these should be used, how they should function, and how best to develop them.

As development proceeded, several decisions were made which impacted the final product. The Team decided to remove Education of CCTT through Computer Assisted Training Technology, a set of instructional programs for training CCTT workstation operators, from CITT since the long-term plan for CCTT is to combine workstations and have them operated by site personnel. The browser was upgraded to Microsoft Internet Explorer 5 (IE5) and Microsoft Agent was upgraded to Version 2. The Navigation function was restructured to provide better information in a more timely manner to CITT users. The Build and Proof function was removed from the CITT, and CCTT Site Tools was included in its place. In conjunction with this decision, the team completed a data collection effort at the CCTT sites at Forts Benning, Hood, and Knox. This effort was directed at obtaining data from appropriate site personnel regarding

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those exercise management tools that would be of greatest value to them. It is anticipated that the major modifications to Navigate and CCTT Site Tools will appear in future developments of CITT.

The need for one additional product of CITT 2.0 development, not included in the Research Program Plan, became apparent as development proceeded. Based on feedback from Army personnel obtained during FE and from additional discussions, the team decided that it would be of benefit to potential CITT users if there was a means to disseminate, independently of CITT, the IO and the two videos (U.S. Army, 1999a, 1999b) produced during the CITT project. Digitized versions of the two videos were obtained and converted to a streaming video format. Several iterations of conversion were completed to produce a file small enough to be used efficiently while still maintaining a high level of quality in both video and audio output. The final conversion resulted in files of less than 100 Megabytes reduced from original files that were more than a Gigabyte. The IO was modified to run independently of CITT and directly from a CD-ROM, and a CD containing the IO and videos was produced (CITT Team, 1999a).

CITT Web Site

The SOWs for CITT and CITT-2 specified the development of CITT in both stand-alone and distributed versions, and in the original CITT project, this had been interpreted as developing essentially the same system that users could run either on a local machine or from a remote system using the Internet. Some of the findings from the CITT project, particularly findings related to the difficulty of accessing the Internet from an Army post, caused the team to rethink the whole concept of the distributed CITT.

The team analyzed user needs for information and training in light of the best use of current technology and concluded that the development of TSPs across the Internet was not a particularly good use. The process of developing TSPs remotely would be extremely inefficient, primarily because it would be a very slow process even using high-speed links to the Internet. The process would involve transfer of very large data elements and would probably produce intolerable waits for the user.

On the other hand, the team did conclude that a good use of technology would be to provide a site from which users could obtain the information they need to make decisions relative to their training needs. The team also decided that the site would provide an ideal location for storing and accessing existing CCTT exercises. Based on these decisions, the focus of the distributed site was changed to being an information center and TSP repository, and, consistent with this change, the name was changed to the CITT Web Site. The Web Site would fulfill three objectives:[3]

1. It would provide all of the information about CCTT, structured training, CITT, etc. needed by the user to support unit training needs.

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[3] It is anticipated that when the CITT is no longer in research and development, these objectives will be met through use of the Reimer Digital Library.

2. It would serve as a repository of TSPs approved for CCTT training and would provide a mechanism for reviewing and selecting TSPs from the repository.

3. It would provide a file transfer capability to allow users to download TSPs from the site and to upload TSPs to the site.

Data collection and analysis to determine the design for a site that would fulfill these objectives was initiated. Members of the CITT team examined existing Internet sites to determine features that would function well on the Web Site as well as a number of references on Internet site design (Alden, 1998; Davis & Merritt, 1998; Driscoll, 1998; Hall, 1997; Morris & Hinrichs, 1996; Weinschenk, Jamar, & Yeo, 1997). They further decided that the site would be fully functional from either IE5 or Netscape Navigator. This decision placed some constraints on the development of the site since there are features in IE5 that are not presently supported fully in Netscape. The team examined the use of newsgroups to provide a means for users to obtain information from each other. They looked at using streaming video technology for making the CITT videos accessible via the site. They looked at various navigation methods including the use of cascading menus. And, they examined various formatting and graphics issues.

Consistent with these analyses and based on the user needs identified, the team began the process of determining the structure of the site. They determined that there would be a home page from which the user would access the CCTT module, the CCTT Videos, TSPs, and the file transfer function. The CCTT module would include the information in the "Learn About CCTT" module of CITT; the CCTT Videos would include access to the two CITT videos in their entirety; TSPs would provide access to the complete repository of CCTT exercises; and the file transfer function would provide the mechanism for downloading TSPs from the site. (The team had previously decided that the upload function would be provided on the stand-alone CITT.) Further along in the process and with the full approval and input of CCTT site personnel, the team decided that an individual information page for each CCTT site would be provided on the Web Site. This would provide a central location where users could obtain information they needed to support their CCTT training at any of the CCTT sites. Data were gathered from each site to provide this information.

Based on the data collection and analysis described, "mock-up" screen shots were produced and shown to the focus group. In general, the design and content were approved by the group, although some specific changes were recommended. Access to the CITT help desk was removed; an advanced search function was added that searches both indices and complete web pages; and the proposed use of a bulletin board was removed.

Once development requirements were sufficiently identified, development of the site using commercial-off-the-shelf software, such as Front Page, InterDev, and SQL Server, was initiated and continued throughout the remainder of the project.

<u>Formative Evaluation</u>

Formative evaluation (FE) was completed primarily in conjunction with the limited fielding of CITT 1.1. This section describes those efforts as well as the limited evaluation that was completed for CITT 2.0.

<u>CITT 1.1</u>

There were three primary objectives for FE of CITT 1.1:

1. To determine whether commanders and other unit trainers could select, modify, and develop CCTT exercises for conventional and FBCB2-equipped platoons and company teams on the P1, P2, and P3 TDBs.

2. To determine whether commanders and other unit trainers could access, modify, develop, and print required training support materials.

3. To determine whether the unit could fully execute, in conjunction with CCTT site personnel, exercises selected, modified, or created.

To test completion of these objectives, the team requested, through the COR, support from units at Fort Benning and Fort Hood, and from an Army National Guard (ARNG) unit. Units needed to be available for participation during the June-October 1999 time frame, and the Fort Hood unit also needed to be involved with the ongoing FBCB2 testing. A timeline for FE with each unit was developed and is shown in Figure 2. The FE with each unit was designed to last approximately two months beginning with identification of the unit and ending when the unit ran the exercises developed with CITT at the CCTT site.
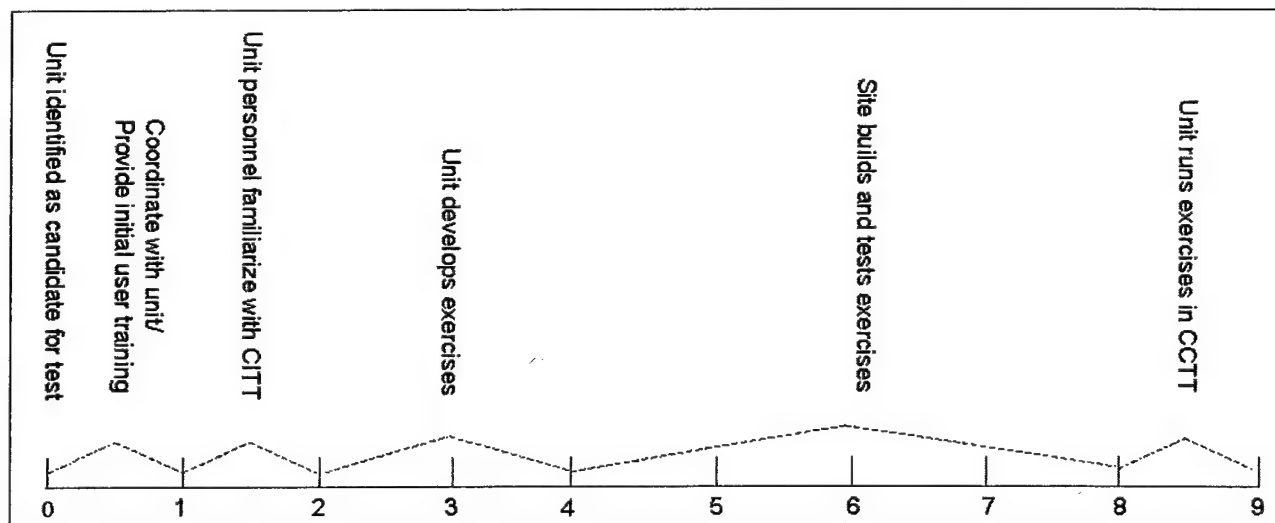
Figure 2. Timeline in weeks for conducting formative evaluation with a typical unit.

Specific units were identified at Fort Benning and Fort Hood. The unit at Fort Hood was also supporting FBCB2 testing. Although much effort was directed at identifying an ARNG unit, due to scheduling challenges, no ARNG units were included in FE limiting the

generalizability of findings to Active units. Table 1 shows the schedule of FE events for the units assessed.

Initial user training consisted of approximately four hours of demonstration and hands-on training at the unit's site with a designated point of contact (POC). The unit was provided a CITT 1.1 system as well as documentation consisting of two Getting Started Manuals (User Getting Started and Administrator Getting Started) and a CITT 1.1 User's Manual. The CITT Team member(s) presenting the initial training made it clear that the POC was responsible for training other unit personnel who would use CITT including those who would participate in additional FE activities. They also informed the POC that a CITT "help desk" was available either via toll-free telephone or e-mail to respond to any questions or concerns users might have while using CITT.

Table 1
Schedule of Formative Evaluation Events

	Fort Benning	**Fort Hood**
Initial User Training	30 June 1999	3 August 1999
CITT Usability Assessment	19 – 22 July 1999	12 – 13 August 1999 and
		16 – 18 August 1999
CCTT Build and Proof	NA	20 August – 28 September 1999
Exercise Execution	NA	29 – 30 September 1999

CITT usability assessment consisted of observation of unit personnel using CITT to produce TSPs. Usability assessment corresponds with "unit develops exercises" in Figure 2. The SOW specified that this phase of FE would consist primarily of passive observation, and data collection forms similar to those used in FE of CITT 1.0 were produced (see Appendix B). However, during actual assessment, the team members who were acting as observers were forced to assume a more active role. In the case of the Fort Benning assessment, the CITT system had been connected to the unit's Local Area Network (LAN), contrary to instructions from the CITT team, which in turn disabled some features, particularly the map and overlay tools. The observers had to produce a work-around which restored nearly all functionality. The observation at Fort Benning occurred as planned with three members of the unit (the brigade master gunner and two battalion master gunners) acting as participants. The brigade master gunner was very familiar with the structured training process and had little difficulty using CITT to develop a usable exercise; the battalion master gunners had little familiarity with structured training and required assistance from the observers and the brigade master gunner rather than risk having them produce unusable exercises. At Fort Hood, one unit member (the assistant operations and training officer) served as participant for the entire usability assessment. However, the unit was under substantial pressure to produce exercises for use in the test of FBCB2 making it imperative that they produce usable exercises. Under this circumstance, passive observation was not practical and considerable assistance was provided by the observers. The implications of attempting to conduct FE with operational units using passive observation methods will be

discussed below. Following observation of the participant while using CITT, interviews were conducted using the structured interview form contained in Appendix B.

The CCTT build and proof activity occurred only at Fort Hood. This corresponds to "Site builds and tests exercises" in Figure 2. In the case of the Fort Benning unit, timing problems occurred between the unit's scheduled CCTT rotation and the availability of site personnel to build the exercises. This was further exacerbated by part of the unit being deployed to Egypt, and, therefore, unavailable to run exercises. At Fort Hood, the exercises were built and tested at the site, and, as anticipated, minor problems were discovered and corrected. This included such things as missing radio frequencies, bumper numbers that changed from original settings, etc. Members of the development team did not observe this phase of FE, although communication between the site and the team was occurring throughout the process.

Exercise execution ("Unit runs exercises in CCTT" in Figure 2) corresponded with the Fort Hood unit's participation in the FBCB2 test. Two members of the CITT team observed this phase of FE and collected data using the observation and interview/debriefing forms contained in Appendix C. Although the unit commander made some initial modifications to the CITT-developed exercises, the unit did conduct the company/team movement to contact exercises developed during the CITT usability assessment phase of FE a total of three times over two days. The CITT-developed exercises did initialize properly and ran sufficiently well to allow the unit to conduct its training.

Additional evaluation, not originally included in the Research Program Plan, was conducted at two locations at Fort Knox. Personnel from the Advanced Non-Commissioned Officers Course (ANCOC) requested a CITT to determine its applicability to their training. Shortly thereafter, personnel from the Armor Captains Career Course (ACCC) requested a system for similar reasons. Systems were delivered along with the initial user training that had been provided at Fort Hood and Fort Benning. Personnel were invited to use CITT as they deemed appropriate but were requested to notify the CITT team of any planned use so that observations could be conducted. In fact, only one observation was conducted at ANCOC; two were conducted at ACCC. The pressures of everyday activities limited the time the users were able to access and use CITT. Implications of conducting evaluation while participants conduct their normal operations will be discussed below.

The final evaluation activity that occurred with CITT 1.1 involved locating CITTs at three CCTT sites (Fort Hood, Fort Benning, and Fort Knox) and at the TRADOC System Manager CATT and Program Manager CATT offices to provide an opportunity for anyone wishing to use them to do so. Thus, a total of nine CITT 1.1 systems were fielded to support FE. An embedded questionnaire is included in CITT and is offered to the user each time he or she makes a normal exit. There is, however, no practical way to force users to complete the questionnaire. In late November, the POCs at each location were instructed to copy the CITT database file to a large-capacity disk provided to them and to forward it to the CITT team. All implementation sites, except for the CCTT site at Fort Benning, complied. The Fort Benning CCTT site had a hardware failure with the disk drive and was unable to copy the file. The database file contained all completed user surveys as well as copies of TSPs produced. Analysis of the returned files indicated that no surveys were completed other than those completed during the observation sessions described previously, and that no additional completed exercises had

been produced. The present study offers no definitive explanation for this finding, however, it could be speculated that users currently view CITT as research and development effort, and that it will need to become institutionalized within the training culture before it will be widely used.

CITT 2.0

Because work on the CITT 2.0 development continued up to the end of the project, there was no opportunity to conduct FE beyond internal testing by members of the CITT team. Even this testing was limited. As components of CITT 2.0 were completed, they were placed on a test machine and members of the team exercised them performing all reasonable actions that users are likely to perform. This was done to determine if the software worked as necessary and to ensure that the system did not "break." All problems and defects discovered were reported to the developers and appropriate modifications were made.

Implementation and Fielding

The research methodology for this phase of the project was directed at producing an implementation strategy and fielding plan/methods for the CITT. This required consideration of the full range of individuals who will use the CITT including remote users and system administrators. In addition, the plan needed to address compatibility of the CITT with Army training information management systems and databases as well as the fielding and sustainment of the CITT.

Initial plans for this activity as presented in the Research Program Plan were for near-term implementation and fielding to address the CITT as it exists at the end of the CITT-2 Project, and for long-term implementation and fielding to examine the integration of CITT into the Standard Army Training System (SATS). Late in the project, the team realized that it needed to consider near-, mid-, and long-term solutions to allow for incremental development of an objective system, further evaluation and refinement of the CITT, and more time for CITT to be configured for integration into SATS.

Our process included reviewing the strategy and plan proposed as part of the initial CITT project, reviewing plans for similar Army training systems (i.e., Automated Systems Approach to Training [ASAT]), and investigating emerging Web technologies and methods for using such technologies.

As part of the initial CITT project we proposed three options for such a plan (Gossman et al., 1999). They were: field CITT specifically to support CCTT; field CITT as a part of SATS and/or ASAT; and develop and field an Integrated Training Tool (environment non-specific). The first option recommended that CITT be fielded as a stand-alone system (software and hardware) to CCTT sites and selected units to ensure that trainers could access information on CCTT training and have available an existing library of CCTT exercise TSPs. This was intended as a short-term solution. The second option recognized a longer-term need that CITT (or any TSP development tool) become part of SATS to provide trainers with one integrated software package for training management activities. This remains the optimum long-term solution. The third option attended to the need for a distributed CITT-like system that supports training

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development efforts for actions in all training environments (live, virtual, and constructive). This option also remains valid and was considered as part of the current effort.

Our review of existing similar Army systems focused on the architecture of ASAT which is administered by the Army Training Support Center (ATSC) and can be classified as a client-server system. The ASAT is a distributed system where each proponent school maintains and works on its own database (MTPs, Field Manuals, TSPs etc.) but shares data with other agencies as required via the Training Module Executive Management Information System (TEXMIS) data repository. Local data are stored on a common server and updated as required by clients who have the required access and authority. Once the data are ready for distribution to others, they are uploaded from the server to TEXMIS where those with the required access and authority have access to them. Once finalized and approved, the data are made available to other clients and the Army at large via the Reimer Digital Library. Likewise, proponent agencies can download data from TEXMIS to their server for manipulation as required. This architecture stands as the model for the long-term implementation and fielding plan described later and makes effective use of today's Web and client-server technologies.

We also recognized it was important to investigate emerging Web technologies and methods being used to manage distribution of data. Midway through the project we were fortunate enough to be offered the assistance of a U.S. Army Reserve Signal Corps Officer currently managing a software development and support center.

The Reserve officer provided a valuable additional viewpoint to the research on the appropriate use of emerging technologies. He agreed to design a server-based architecture that would meet the long-term requirements for a distributed system akin to what ATSC currently uses within the U.S. Army Training and Doctrine Command community. This effort focused on using new Web technologies to provide a robust system that allows unit trainers access to up-to-date training information, exercise TSPs, and the ability to modify or create TSPs as required. The requirement for users to have ready access to information and training materials that support the development and execution of structured training that meets their specific training needs remained at the core of this process. For the near- and mid-term plans, a CITT for CCTT training was considered; the long-term plan addressed a system architecture that is not simulation-specific.

Our research focused on expansion and refinement of each of the three options proposed in the initial CITT project. We considered the current plans for CITT development, the current plans for CCTT fielding, units' abilities to access information via the Internet, along with those options which are feasible considering future plans being considered by affected agencies (specifically PM-CATT and ATSC). Under this broad set of considerations, we addressed the following specific questions:

1. Where and to whom should CITT be fielded?

2. What is the need for initial user training; what is it; and who gets it?

3. What is the need for a "Help Desk?"

4. Who should maintain the Web Site and where should it be hosted?

5. What skills and numbers of personnel are required to maintain the CITT?

6. What is the process for exercise TSP development, approval, and distribution?

Results and recommendations from this research task are presented below along with results from all research activities.

Results

This section focuses on the outcomes and products of the research activities described above.

Design the Enhanced CITT

The major outcome of the design activities is a complete description of the enhanced CITT presented in the form of IDEF0, IDEF3, and Dynamic Data Exchange diagrams and tables. The design reflects how the enhanced CITT will function and supports its continued development. The design is fully consistent with existing Army training systems and those expected to exist in the near future. Examples of top level design in the form of two IDEF0 diagrams–an Input, Control, Outcome, Mechanism diagram and a node tree diagram are shown in Figures 3 and 4 respectively.
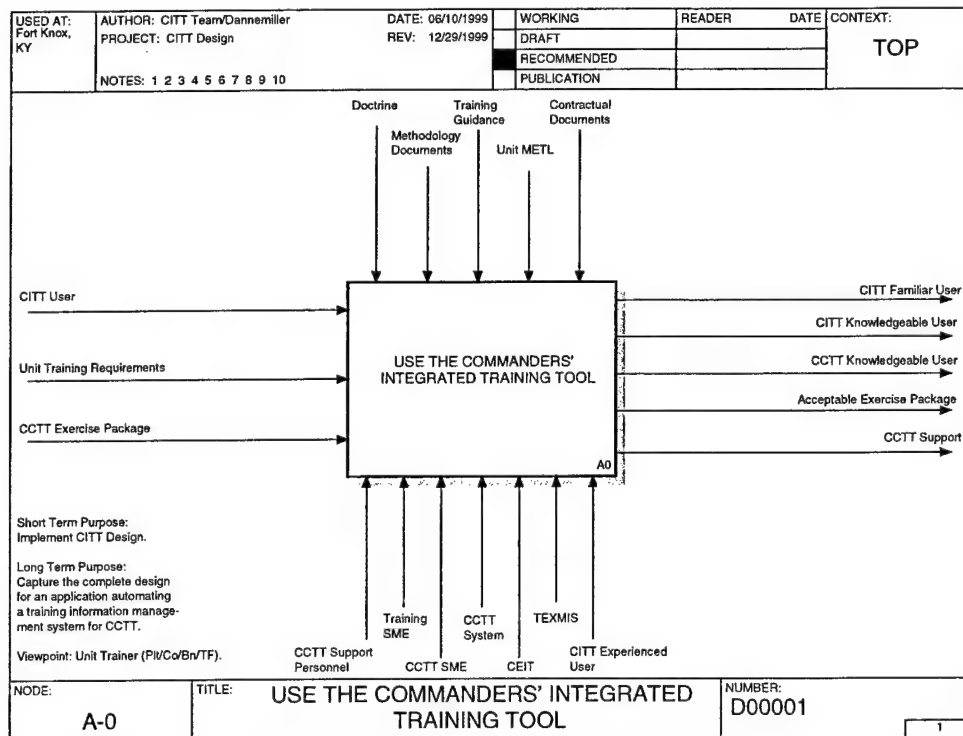
Figure 3. Enhanced CITT design top level Input, Control, Outcome, Mechanism.

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```
                    USE THE COMMANDERS'
                  INTEGRATED TRAINING TOOL
                                        A0


  Learn about CITT      Learn about CCTT       Produce Training      Coordinate Support
                                                  Materials              Functions
                A1                    A2                      A3                    A4
  • Examine CITT        • Explore  CCTT        • Select an Exercise   • Package Exercise
  • Navigate CITT       • Examine  System      • View the  Exercise     Materials
  • Use the Tutorial      Capabilities         • Develop an Exercise  • Assess a CITT
                        • Examine  Training    • Complete the CCTT      Exercise for
                          Capabilities           Initialization File    Distribution
                        • Learn about  the                            • Review Site
                          Training Process                              Operations
                        • Learn about                                   Documents
                          Structured                                  • Schedule the CCTT
                          Training                                      Site
                        • Learn about  CCTT
                          Exercises
```

| NODE: A0 | TITLE: USE THE COMMANDERS' INTEGRATED TRAINING TOOL | NUMBER: D00001-N |

Figure 4. Enhanced CITT design top-level node tree diagram.

The complete design is contained in an ARI Research Note (Dannemiller & Gossman, in preparation). This Research Note has two primary purposes: the short-term purpose is to describe in detail the CITT design for presentation to and review by appropriate agencies such as ATSC; the long-term purpose is to capture the complete design such that an application based upon it can be built at a later time. Descriptions of the functions and use of the different types of design methods along with the complete set of design documents for the CITT are included in the Research Note.

Develop Second-Generation CITT Prototype

CITT 1.1

As described above, the CITT 1.1 was produced in a relatively short time for limited fielding to support FE, and, as such, the changes and modifications were primarily related to FBCB2 and the P1 TDB.

Overall, the application database grew approximately 40%. Five MTPs related to digitally equipped units were added as were four exercises (two digital and two on the P1 TDB.) Thus, CITT 1.1 shipped with a total of 39 exercises. The application ran substantially faster than CITT 1.0 due to the fact that when an exercise was accessed, icons depicting documents and maps were loaded rather than the actual document or map. This significantly reduced record size. It also shipped with an updated IO and Help and with guidelines for converting conventional exercises to digital and vice versa.

CITT 1.1 was installed on PM-provided computers and fielded at nine locations as described above under FE.

CITT 2.0

In keeping with the CITT 2.0 development goals of simplifying the user interface and the TSP development process, a number of modifications were made and/or functions were added based on the input of the focus group:

1. The Training Event Diagram was renamed the Exercise Concept Sketch.

2. The Overlay was renamed the Mission Concept Sketch.

3. The user was given the ability to modify the conditions and standards for each task.

4. "Why" buttons were added to most screens.

The first two modifications above were recommended by the focus group to simplify the terminology used in CITT. The third was recommended to provide more flexibility to the trainer in designing an exercise. The fourth was a result of the group's discussion regarding adding more cognitive information. That is, not only does the CITT lead the user through the TSP development process, it also provides the user with information on why and how components of the TSP fit into the overall structured training process.

Figures 5 and 6 display some of the features and characteristics of the CITT 2.0 at the completion of the project. Figure 5 is the opening screen which allows the user to access the various CITT functions including the CITT Overview, the Learn About CCTT Information Overview, the CCTT Site Tools, and the Produce Training Materials. It allows access to the CITT Administrative Tools which provide the functionality required to transfer or upload exercise TSPs to a central repository. And it includes access to the embedded User Survey which allows the user to provide feedback to the development team if he or she so desires.

Figure 6 is an example of one screen taken from the Create Exercise TSP branch of the Produce Training Materials function. This specific screen illustrates how the user establishes initial settings for a mission within which an exercise is developed. Of significance is the fact that this, and most other screens in the Produce Training Materials function includes a "Why" button. When users access the "Why" button, they are provided with a detailed explanation of the "cognitive" aspects of TSP development. That is, they are given information on how an activity fits within and supports structured training in order to provide them with a basis for what they are doing as opposed to simply helping them complete the activity.

Figure 5. Initial CITT screen.

Figure 6. An example of a Produce Training Materials screen.

CITT Web Site

The results of the Web Site development activities are best viewed at the site itself–www.cittcctt.org. Development of the site continues on an on-going basis. However, there are a number of specific outcomes of the development activities that should be described in this report.

First, it should be noted that there was nearly a two-month delay on starting development of the site due to uncertainty regarding what would be in the CITT database and in CEIT. An important lesson learned from this project is that final decisions on the database structure must occur for web-based development to occur.

For the most part, the Web Site provides all of the planned functionality. There are, however, some limitations. The View an Exercise function allows the user to view only three components of the TSP: the Exercise Description, the Exercise Concept Sketch; and the Event Description including exercise tasks. The user can download the entire TSP, but only these components can be viewed from the Web Site. In addition, the user can not print from the site.

On the other hand, the user can access the complete Learn About CCTT module of CITT; there is access to the CITT videos; there is a fully functioning newsgroup capability; TSPs are available for review and download; the upload TSP function operates; there are links to other relevant Army Internet sites; and there are pages containing information for each of the CCTT sites. The site includes an expanded search capability which allows users to search entire web pages, not just the keyword indices, as well as advanced navigation capabilities which facilitate its use. These functions are illustrated in Figure 7.
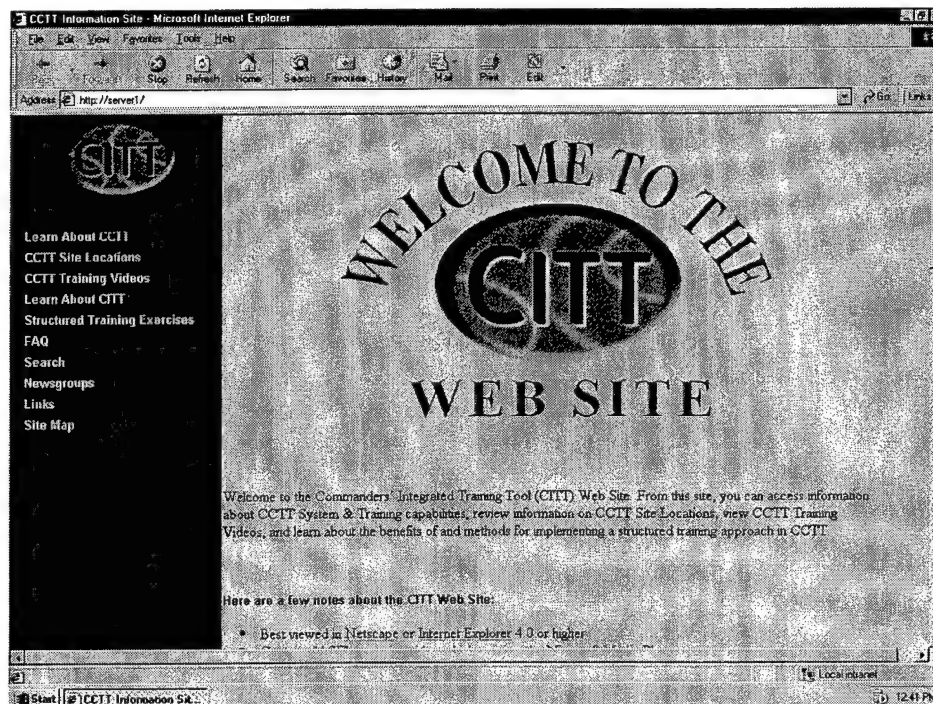

Figure 7. Introductory screen of the CITT Web Site.

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Formative Evaluation

CITT 1.1

Help Desk. No calls or e-mail were received via the CITT help desk during the period in which CITT 1.1 was fielded. It is unclear why this result occurred. It is possible that there were no difficulties encountered by users; it is also possible that there were simply few people actually using CITT. This is consistent with results from the CITT data retrieval that occurred in December as described below.

CITT Usability Assessment. As described above, usability assessment occurred at Fort Hood and at Fort Benning. Because of substantial differences in the way assessment occurred at each site, they will be discussed separately.

At Fort Benning, three participants were observed over a four-day period. All participants were using CITT to develop platoon gunnery exercises. As the first participant began developing an exercise, it became clear to the observers that CITT was not operating correctly. Specifically, the map and overlay tools were not functioning at all. The observers discovered that the CITT machine had been connected to the unit's LAN, and, because the map and overlay tools are installed directly to the WindowsNT administrator identification (ID), they would not function with any other user ID. Moreover, as would be expected in most network environments, the network administrator had removed the administrator ID from the machine. The remainder of the first morning was spent correcting this problem and getting the map and overlay tools to function. Once corrected, usability assessment resumed.

For the most part, passive observation was employed, although, if a participant requested help and had been unable to determine an appropriate action himself, assistance was provided. Also, if it became clear to the observers that a participant was having difficulty or was heading in a direction that would prove futile, assistance was offered. In this instance, the three participants were quite different in terms of their understanding of structured training concepts and principles as well as their level of computer literacy. The participant who understood structured training quite well and was highly computer-literate required little assistance, and the assistance required was primarily when either the map and overlay tools or the print function did not work properly. A second participant was computer-literate but had little concept of structured training. After coaching on structured training, he was able to use CITT with minimal assistance. The third participant was neither computer-literate nor had a good understanding of structured training concepts. This participant required extensive coaching throughout the assessment. Results from this limited sample suggest that the more versed in the concepts of structured training a participant is, the more efficient and effective his use of CITT will be.

Another aspect of the assessment at Fort Benning concerns the environment in which FE occurred. The CITT machine had been located at the brigade master gunner's desk in the brigade operations shop. All three participants used CITT at that location. The environment was very noisy and participants were frequently distracted from their use of CITT by telephone calls, questions and requests from other unit personnel, and so forth. While this may be similar to the environment in which CITT will ultimately be used, it was a difficult environment in which to

conduct FE. A more controlled environment would likely produce better results especially in the early phases of system development and FE.

All participants successfully developed at least one exercise, although one did not enter the complete Operations Order (OPORD). In general, they provided positive reactions to CITT both on the embedded survey and during the interview/debriefing. All stated that CITT would be a valuable tool for units as they prepared for training in CCTT.

Following completion of usability assessment, members of the CITT team who had participated as observers met to debrief and to produce a list of findings and/or implications for CITT development. Appendix D contains a list of 36 findings (including those from ANCOC described below). This list of findings was subsequently used as the basis for a CITT team synchronization meeting to discuss implications and implementation in future versions of CITT. Some of the more significant findings include:

1. CITT needs to work properly even when the host machine is attached to a network. This is especially important in light of implementation and fielding recommendations listed below, particularly as related to the use of the CITT Web Site as a TSP repository.

2. Coordination between the CITT team and the CEIT development team is crucial to ensuring that CEIT functions properly within CITT. In addition, CEIT-specific help needs to be written; if the CEIT team is not producing help, the CITT team needs to.

3. The print function of CITT needs to be made efficient. Currently, CITT employs the print preview function of Microsoft Word in order to print parts of the TSP. This is confusing to the user and inefficient. (In fact, a patch to CITT was produced that corrected this problem and was distributed to all CITT 1.1 sites.)

4. CITT needs to be fielded with a formalized training process unless or until structured training concepts and principles become part of the basic or advanced courses for officers and non-commissioned officers.

5. Current navigation in the Create module is confusing. Users may think they have completed exercise creation when, in fact, they have completed only the exercise outlines.

6. In the Create module, the current default is "Complete" for each exercise created. If a user exits CITT prior to actually completing the exercise and then returns, he is unable to complete the exercise using the create process. He is forced to use the Modify module. The default needs to be changed so that the user can use the Create module throughout the development process.

Usability assessment at Fort Hood involved one participant and occurred in two sessions–the first lasted two days; the second lasted three days. The assessment was planned to coincide with the FBCB2 test and required that exercises be developed and delivered to the CCTT site by 18 August 1999. This resulted in a change of focus from collecting FE data to ensuring that the unit developed exercises that fit their training needs. The CITT team observers became active participants in exercise development rather than passive observers limiting conclusions that can be drawn from the sessions.

The end result of usability assessment with the Fort Hood unit was that three exercises were developed to be used in the FBCB2 test which corresponded to the exercise execution phase of CITT FE. The participant, as well as other unit personnel, provided favorable impressions of CITT, and, in fact, indicated a desire to have CITT 2.0 to assist in preparation of the unit's scheduled February CCTT training. In the survey and in debriefing, the participant also mentioned the desirability of having CITT produce a file that could be used to initialize an exercise at the CCTT site which is the ultimate intent of CEIT.

As with Fort Benning, CITT team observers debriefed the sessions at Fort Hood and produced the list of findings provided in Appendix E. These were presented to the entire team and decisions were made on how, or if, they would be handled in future versions of CITT. Representative findings from Fort Hood include the following:

1. The unit had connected the CITT machine to their LAN resulting in the same problems as those encountered at Fort Benning.

2. The CITT install failed because the machine did not have Microsoft Agent installed.

3. The quality of the videos used in the Tank and Mechanized Infantry Platoon Demonstrations of Performance is very poor when using a laptop computer. This is probably due to the lower video memory on the laptop.

4. The CITT uninstall function does not completely remove CITT.

Two locations at Fort Knox provided the final usability assessment data for the project: ANCOC and ACCC. Two sessions were conducted at ANCOC; one session was conducted at ACCC. However, unlike Fort Benning and Fort Hood, the sessions were much shorter (less than two hours) and were done at the discretion of the participants. The participants were not debriefed, and neither completed the embedded survey. The findings for ANCOC are included in Appendix D along with those from Fort Benning; the findings from ACCC are included in Appendix E along with those from Fort Hood.

CCTT Exercise Build and Proof. The exercise build and proof phase of FE was conducted only at Fort Hood. (For reasons outside the scope of this project, exercises developed at Fort Benning were not built at the CCTT site. Part of the unit was deployed to Egypt, and the brigade master gunner was assigned to temporary duty at the Fort Knox ANCOC.) Members of the CITT team did not observe the build/proof activities at Fort Hood; however, they did interview site personnel several weeks after the exercises were built. The report at that time was that the information necessary to build the exercises was contained in the TSPs received from the unit, but that it was difficult to find unless one is very familiar with the TSP materials. The TSP does not contain a statement of exercise focus or intent, and there were problems with the commo lists. Site personnel reported that they thought the map and overlay tools could be more user friendly. They also reported that units do not participate in the build/proof process.

Exercise Execution. Exercise execution was conducted at Fort Hood with two members of the CITT team serving as observers. The exercise that had been developed using CITT was a Company/Team Movement to Contact exercise that included all friendly and enemy semi-automated forces required for a complete mission set. However, on the first morning, the

company commander decided to abandon the original plan and have his platoons conduct platoon-level tactical movement from an assembly area (AA) to the line of departure. On the first afternoon and all of the second day, the unit ran the CITT-developed movement to contact exercise three times. For each running, the unit started in the AA and conducted a movement to contact until the training company was combat ineffective. The battalion operations officer served as the observer/controller (O/C).

The CITT-developed exercises initialized properly and ran well enough to allow the unit to conduct its training. On the other hand, there were a number of difficulties, only some of which are attributable to CITT. The unit had not written an OPORD, nor did the unit use exercise graphics in preparing to run the exercise. The O/C did not use the after action review (AAR) sheets included in the TSP, opting instead to use index cards. There was a lack of clear instructions on assigning and using the FBCB2 workstations at the AAR workstation. The company commander and operations officer were unaware that the FBCB2 workstations at the AAR worked and could be used to monitor and affect the unit's performance during the exercise. During the TSP development process in CITT, the user needs to be able to designate vehicle assignments for the FBCB2 workstations at the AAR.

Follow-up interviews of unit personnel indicated that there was some confusion regarding CITT replacing face-to-face meetings with site personnel. Unit personnel had operated under the assumption that no coordination between the unit and site was required once the paper TSP was delivered to the site. Initial training when CITT is delivered needs to clarify the unit-site communication and interaction. There was concern expressed by unit personnel that units do not have sufficient time to create exercises. They recommended that CITT include a broader, more diverse base set of exercises for units to select from and modify if necessary. This library of exercises should contain exercises for different types of units on different terrain fighting against the appropriate OPFOR. The OPFOR should be theater-specific and fight using the appropriate doctrine.

A final observation from the CITT team: the unit and site personnel never conducted a joint proofing of the exercise which would have shown whether timings, locations, and points of initial contact were correct. When the unit ran the exercise, it became clear that it was written at a "run" level. The enemy met the unit at a location where they had the advantage, quickly closed its second and third echelon formations on the training unit and had artillery pre-positioned to attack. The O/C was unaware that he could change the exercise as it was running, which led to the unit conducting a difficult exercise first and being defeated. After being told he could modify the exercise, the O/C had the unit rerun it twice under less difficult conditions. The actual progression was "run–walk–crawl." This difficulty would have been avoided had the unit and site personnel jointly proofed the exercise.

CITT 2.0

As described previously, FE conducted on CITT 2.0 consisted only of internal testing. All problems and defects found were reported to the developers. It is anticipated that a future project will have FE of CITT 2.0 as one of its major foci.

Implementation and Fielding

The key findings that impact a comprehensive implementation strategy and fielding plan suggest that an incremental or staged approach to the fielding of CITT is appropriate. The following is a list of findings that resulted from our review. This includes the notion that CITT can and should initially be fielded as a stand-alone system in support of CCTT training, and that a dedicated training support system needs to be developed to support unit trainers as they design and develop training for all environments.

1. The CITT 2.0 and the new CITT Web Site have not been fully evaluated, so further evaluation and refinement are needed before putting CITT into production. This requires another round of limited fielding for evaluation purposes.

2. For the time being CITT should remain focused on CCTT training.

3. Not enough research has been done to identify how CITT should be integrated into SATS; therefore, CITT should initially be fielded as a separate system (CITT 2.0 for PCs and the CITT Web Site).

4. The CITT fielding should be closely aligned with CCTT fielding plans.

5. At the end of the next round of evaluations, CITT should be moved from R&D to an agency with the resources and skills to implement full fielding, sustainment, and future development.

6. Future systems should take full advantage of emerging Web technologies to provide unit trainers even more ready access to CITT functions.

7. Operational units need a training support system (hardware and software) similar to ASAT to fully support training development in the field.

8. CCTT and CITT initial training should become part of institutional programs of instruction to help ensure that unit leaders know how to make the best possible use of the CCTT.

With these findings in mind, the team developed a three-stage strategy: near-term – March 2000 to January 2001; mid-term – January 2001 to December 2001; and long-term – January 2002 and onward. Following this staged strategy will support the immediate R&D need and allow for future development efforts that include integration with existing Army Training Information Management Program (ATIMP) systems. Each stage includes fielding, implementation, and staffing recommendations.

Near-Term

In the near-term CITT should be fielded to support further evaluation and refinements to enable the development of a fully fieldable system. To support this plan CITT 2.0 software should be installed at all existing CCTT locations. A laptop computer with CITT 2.0 should be delivered to a Training Support Battalion (TSBn) that supports an ARNG unit in Tennessee or

South Carolina that uses the Mobile CCTT. During this stage the CITT Web Site would be hosted at Fort Knox to help facilitate further testing and refinement.

The CITT Team would implement near-term implementation and fielding by delivering the new software and system to existing CITT sites and to the TSBn. The team would provide initial user training for commanders, other unit trainers and CCTT Site staff. The team would also maintain the CITT "Help Desk" and conduct evaluation of CITT 2.0 software and the CITT Web Site.

Mid-Term

The mid-term stage provides for the fielding of CITT 2.1 and a refined Web Site. CITT 2.1 software would be fielded to existing CITT locations; PCs and 2.1 software would be fielded to the newest CCTT sites and selected units supported by those sites. At this stage, CITT should be fielded to each brigade supported by a CCTT Site. Additionally, each TSBn supporting units using Mobile CCTTs should receive a laptop with CITT 2.1 installed.

Implementation of this stage becomes a joint effort between the development team, proponent schools, and PM-CATT. The CITT Team would deliver software to existing sites and provide initial user training as in the near-term stage. This would be done as part of the anticipated follow-on effort to CITT-2. Once this initial fielding is completed, responsibility for CITT would be passed to either PM-CATT or ATSC. The selected agency or its contractors would complete the fielding of CITT to new CCTT Sites, TSBn's, and brigades supported by CCTT. Additionally, they would host the CITT Web Site and maintain the CITT "Help Desk." The final part of this stage is the inclusion of CITT initial training in officer basic and career courses and ANCOC at the Armor and Infantry Schools. This would enable units to take full advantage of the exercise development functions and training information that are a part of CITT. It also provides for CITT support to all units, schools and agencies supported by CCTT and sets the foundation for further development and fielding of CITT. Finally, it moves CITT from an R&D effort to a production effort and provides for the sustainment of its content and functions.

Long-Term

Long-term fielding and implementation puts CITT (or a CITT-like system) into the mainstream of Army systems and provides for full fielding of CITT. In this stage the objectives are to make full use of technology to support Army-wide distribution of data, implement the "To-Be" CITT design and field a system that supports training development and management for unit commanders and trainers. This includes fielding a CITT-like system to active component battalions/squadrons, Reserve Component TSBn's that support Enhanced Brigades, institutions, and CCTT Sites.

In this stage CITT should become a part of the appropriate ATIMP system and link to other systems as designed. The CITT servers should be located at each installation that has a CCTT site to facilitate data distribution. Implementation should be continued as in the mid-term stage, however updates/upgrades would be provided via the Web whenever possible.

This stage would require more system development and use of new technology to enhance the distribution of data. The CITT would become akin to ASAT but reach into units throughout the Army and enable the sharing of exercise TSPs, distribution of new information on training, and automatic software upgrades via the Web.

Table 2 shows the personnel required to maintain and field CITT during the mid- and long-term implementation and fielding stages. This staffing is required to provide the requisite upgrades, updates and refresher training for the CITT. The personnel listed would be located at a central site, and selected members would be tasked to create a Mobile Training Team (MTT). This MTT would travel as required to new sites, units, and schools to implement upgrades, updates, and refresher training.

Table 2
Staffing Requirements for Mid- and Long-Term Implementation Strategy and Fielding Plans

Position	Function	Personnel	MTT
System Administrator	In addition to primary duties: responsible for the operation and maintenance of the CITT; maintains baseline hardware and software configurations; conducts preventative and corrective maintenance on the CITT; as required identifies new technologies to be incorporated into the CITT.	1	X
System Engineer	In addition to primary duties: Responsible for the maintenance and operation of the "Help Desk," troubleshoots all reported faults and errors; develops detailed test plans for diagnosing CITT hardware and software faults; identifies errors and their causes; reports findings to CITT users.	1	X
Programmer	In addition to primary duties: Responsible for all programming requirements of the objective CITT and supporting web-based application; designs and develops enhancements to the CITT in accordance with guidance received from the Training Developer and Military Subject Matter Expert.	2	
Training Developer	In addition to primary duties: Responsible for all training development requirements needed to support the CITT; is a subject matter expert in the training development process identified in US. Army Training and Doctrine Command Regulation 350-70 (Department of the Army, 1999); interfaces with CITT users to ensure full understanding of the embedded training development methodology; interfaces with proponent agencies to ensure full compliance with evolving doctrine; as required, identifies new features to be incorporated into the CITT.	1	
Military Subject Matter Expert	In addition to primary duties: Serves as resident expert on military operations for mechanized forces (armor and infantry) from the platoon to brigade level; interfaces with CITT users and proponent agencies to ensure full compliance with existing military operations and training doctrine; as required, identifies new features to be incorporated into the CITT.	1	
	Total	6	NA

Lessons Learned

There are a number of lessons learned from this project that will be of value to similar future projects as well as to the fielding and implementation of the CITT itself.

1. The CITT provides a valuable tool to the user which can aid development and delivery of training designed specifically to meet the unit's needs. However, it is not a "cookbook" tool—it does not replace or make up for the fact that the user needs to have a good, working understanding of the concepts, principles, and practices of structured training development and delivery. The most successful users of CITT have been those who had the most knowledge regarding structured training. While the CITT 2.0 prototype and the CITT Web Site both contain a substantial amount of information on structured training, it would, nevertheless, be of great benefit to include this information in current institutional training. It appears from data collected in this project that knowing this information in advance greatly facilitates CITT use and the products produced.

2. Acceptance of the CITT will be difficult if units perceive it as "more work." Participants in both the current project and the previous CITT project have commented on the fact that, at first glance, CITT appears to take a good deal of time and involve a good deal of effort. Several made comments such as "commanders won't have the time to do this." For CITT to succeed, it is important that users see its benefits to them from the very beginning. It must also offer the user a process that is as efficient as possible while maintaining the effectiveness of the exercises developed using it.

3. The use of the focus group in the current project was much more efficient than in the original CITT project. In the original project, meetings typically lasted an hour or less versus the three to four hour sessions in this project. This provided sufficient time for the team to present information at a meaningful level, and for the focus group to provide considered responses.

4. Even though there was a high level of cooperation and coordination between the CEIT and CITT development teams, it is difficult to integrate two projects that have different timelines and different priorities. In CITT, for example, the development of the shared database is critical to being able to automatically populate appropriate fields in the TSP. In CEIT, on the other hand, the shared database is secondary to developing the reader file used to transfer data between CEIT and the CCTT.

5. When conducting FE, there is a trade-off between maintaining control in the test environment and using participants at their "home" location who are doing "real" work. At Fort Hood, for example, the needs of the unit to develop real exercises within a short time frame superceded the needs of the CITT team to collect FE data resulting in limitations to the data collected and on their interpretation. Early in a system's development, what is needed is to test all parts of the system in a predictable way so that one can see how the various components interact and what needs changed or improved. This can be accomplished more efficiently using participants who are representative of the potential user population and who are provided specific test cases or scenarios.

6. The various CCTT sites have different site-specific procedures for developing and modifying exercises. For example, the time required between submitting an exercise and having that exercise ready to run in CCTT varies. In addition, some sites involve the unit in proofing new or modified exercises; some do not. In order for CITT to be used to its maximum potential, it will be advantageous to have a common set of exercise management procedures across all sites.

7. Related to item 6, the CCTT sites' primary function is to train units, not to write TSPs. When units request modifications to exercises, the sites are able to make changes to the execution files readily; however, the exercise TSP that corresponds to the exercise is not changed. The result is an increasing number of exercises in the sites' databases of executable exercises that have no corresponding TSP for units to use to prepare for and run the exercise. The CITT provides the most appropriate tool for the sites and/or the units to update the exercise TSPs; however, until CITT is institutionalized into the Army's training system for the CCTT, it is unlikely that this updating will occur.

8. It is very resource-intensive to develop an Internet site for both IE5 and Netscape Navigator. While such development can and is being done in the public sector where both IE5 and Navigator are used extensively, it would be beneficial to the Army to decide on one browser for use across the Army. This would eliminate the need to do parallel development.

Summary and Recommendations

This report has described the R&D efforts to expand and enhance the CITT for the CCTT. The CITT will provide commanders and other unit trainers with the capability to develop structured training exercises for use in the CCTT virtual trainer including the ability to select existing training exercises that match their unit's needs, and if no such exercises exist, to modify existing exercises or create new ones. The primary outcomes of the project include: the design for the enhanced CITT which is fully documented in a separate report; the CITT 2.0 which has been refined and enhanced based upon FE results as well as upon expanding the capabilities of earlier versions to include exercises for digitally equipped units, alternate terrain maps, enhanced CEIT features, and the capability to upload exercises to a central repository; the CITT Web Site which provides remote access via the Internet to a repository of existing CCTT exercises which users can review and download if desired, extensive information on CCTT training capabilities, structured training principles, etc., a newsgroup, links to other relevant web sites, and information on each of the CCTT sites; and near-, mid-, and long-term implementation and fielding plans for the CITT.

It is recommended that future follow-on efforts to this project examine or consider the following:

1. The integration of FBCB2 into CCTT training and into exercise TSPs. Where should FBCB2 considerations be included; how should they appear at the AAR workstation; and how and to whom should the AAR workstation operator assign FBCB2?

2. The inclusion of formalized training in implementation and fielding of CITT at both units and CCTT sites. This training should emphasize the structured training process.

Additionally, greater emphasis on structured training should be incorporated into the curriculum of existing Army training efforts such as ANCOC and ACCC.

3. The use of a common or similar GUI for both the CITT and the Web Site. This will make it easier for users to use both.

4. The implementation and support of the CITT Web Site in the long term. Even after the site is fully developed, it is highly likely that it will require a high level of maintenance to keep it current with the latest Internet technology as well as advances in the virtual training environment. CITT will also require maintenance to keep it current with content changes, (e.g., tasks, tactics, techniques and procedures; doctrine) that impact training in the CCTT.

5. The plan for all CCTT sites to use common software releases beginning January 2000. This should simplify future development efforts.

6. The use of both test cases and naturalistic observation in future FE of the CITT. Test cases provide more control of the specific CITT functions tested, while naturalistic observation of users in their home environment better assesses how the CITT will actually be used.

7. Exercise management including the approval process for including user-developed exercises in an exercise repository available to other Army personnel.

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Appendix A
Acronyms

AA   assembly area
AAR   after action review
ACCC   Armor Captains Career Course
AFRU   Armored Forces Research Unit
ANCOC   Advanced Non-Commissioned Officers Course
ARI   U.S. Army Research Institute for the Behavioral and Social Sciences
ARNG   Army National Guard
ASAT   Automated Systems Approach to Training
ATIMP   Army Training Information Management Program
ATSC   Army Training Support Center

CATS   Combined Arms Training Strategies
CATT   Combined Arms Tactical Trainer
CCTT   Close Combat Tactical Trainer
CEIT   CCTT Exercise Initialization Tool
CITT   Commanders' Integrated Training Tool
CLS   contractor logistics support
COR   Contracting Officer's Representative

DA   Department of the Army

EDUCCATT   Education of CCTT through computer assisted training technology

FBCB2   Force XXI Battle Command Brigade and Below
FE   formative evaluation
FM   field manual

GUI   graphical user interface

ID   identification
IDEF   Integrated Definition
IE5   Internet Explorer 5
IO   Instructional Overview

LAN   Local Area Network

MAJ   Major
METL   mission essential task list
MTP   Mission Training Plan
MTT   Mobile Training Team

O/C   observer/controller
OPFOR   opposing forces

OPORD   operations order

P1   Primary 1 (Temperate Forest Terrain Database)
P2   Primary 2 (National Training Center Terrain Database)
P3   Primary 2 (Fort Hood Terrain Database)
PM-CATT   Program Manager for the Combined Arms Tactical Trainer
POC   point of contact
PVD   plan view display

R&D   research and development

SAF   semi-automated forces
SATS   Standard Army Training System
SFC   Sergeant First Class
SOW   statement of work
STRICOM   U.S. Army Simulation, Training, and Information Command

TDB   terrain database
TED   training event diagram
TEXMIS   Training Module Executive Management Information System
TRADOC   U.S. Army Training and Doctrine Command
TREDS   tactical reconnaissance and exploitation demonstration system
TSBn   training support battalion
TSP   Training Support Package

VB   Visual Basic

Appendix B
Usability Assessment Observation and Interview/Debriefing Forms

DIRECTIONS FOR USE:

Procedure

Place your name on the front of the booklet. Each FE observer will be provided with his/her individual copy.

At the beginning of each observation session, complete the Test Case Identification information. Record the Participant's name, the date, and the start time of the test.

During the observation session, record your observations on the portion of the sheet labeled "Observations." Each time the participant accesses "Help" put a tally in the "Help" column at the point in your observation at which Help was accessed. The Location column information is recorded using the Observation Guidance Form and indicates where the Participant was in CITT when the observation was made. At the completion of the session, record the Stop Time. Use as many recording sheets as required for the session.

Rationale

In accordance with the Formative Evaluation plan, we are particularly interested in the time taken to complete each module, the paths the user takes through CITT, whether a successful outcome was reached, the types of navigation problems that occurred, any system errors that occurred, and difficulties the user experienced as he/she used the CITT. (Other FE data will be collected through surveys and interviews.) The goal is to capture as much of the session as practical; however, based on prior user testing, we need to recognize that we can not record every action taken by the participant nor every question/comment made.

Providing Assistance

At the bottom of the Observation Guidance form is a box labeled Exercise Assistance. This shows the progression of assistance the participant should be provided in the event he/she experiences difficulties with the assessment. Our overall goal is passive observation; however, based on prior user testing, it is anticipated that assistance will occasionally be required.

When required, observers should provide the minimum assistance necessary. The first action should be to suggest that the participant try the CITT Help. This will often be sufficient to solve the problem. If that is not successful, provide a general hint or assistance. For example, "You might want to consider the task steps you want the unit to perform." If that is still not sufficient, provide a direct instruction. For example, "Go to Select Initial Settings and list the task steps you want the unit to perform."

As assistance is provided during a session, it is important that the details be captured and recorded. We need to note when assistance was required, the nature of the assistance provided, and the extent of the assistance provided. The need for assistance may represent a flaw or weakness in CITT; however, we will not be able to determine this unless we have detailed information on the assistance provided.

P:_____ Sheet _____ of _____

Date: _____ Start Time: _____ Stop Time: _____

Location: Observations: Help:

_____   _____   _____

_____   _____   _____

_____   _____   _____

_____   _____   _____

_____   _____   _____

_____   _____   _____

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B-3

Guidelines for Interview/Debriefing Session following CITT Usability Assessment

The debriefing should occur after the participant has completed the on-line CITT survey.

The debriefing supplements the data collected during observation and from the survey and can be used to elaborate on data previously collected. The debriefing should be conducted using a conversational format; however, the general categories listed below should be covered.

1. Follow up on any items/concerns remaining from the CITT assessment observations, for example, any questions you made note of during the assessment re: why a participant took a particular action.

2. Ask participant for his overall impression of CITT in terms of:

- Look and feel
- Ease of navigation
- Ease of use
- Map/Overlay Tool

3. Ask participant about the information included in Learn About CITT:

- Value of the content
- Readability
- Use of audio and video
- Ease of navigation (links, navigation bar, etc.)

4. Ask participant about the on-line help.

- Relevance to reason he accessed help
- Satisfactorily answered his questions

5. Ask participant about Education of CCTT through computer assisted training technologies (EDUCCATT).

- Did he/she access EDUCCATT
- Did EDUCCATT provide the information/training needed
- Overall impression of EDUCCATT

6. Ask participant what, if anything in CITT, made it difficult to complete his task.

7. Ask participant what features of CITT were especially useful.

8. Ask participant what, if anything, he would like to have had in CITT that wasn't included.

9. Ask participant for any other comments he wishes to provide.

Appendix C
Exercise Execution Observation and Interview/Debriefing Forms

DIRECTIONS FOR USE:

Procedure

This booklet contains the recording forms for use in the Exercise Execution phase of the CITT 1.1 formative evaluation at Fort Hood. Place your name on the front of the booklet.

The booklet contains two types of recording forms: forms for Exercise Execution observations, and interview/debriefing forms for CCTT Site and Unit personnel.

Exercise Execution Observations

During the Exercise Execution activities, record your observations on the forms provided. In accordance with the Formative Evaluation plan, we are interested in whether the unit was able to successfully execute the exercises selected, modified, or created using CITT. It is not feasible or necessary to provide a contemporaneous record of the Exercise Execution process; rather, we are interested in actions and outcomes which indicate difficulties or errors in the execution of the exercises. The recording forms provide space for the following: a description of the error/difficulty, and your analysis of the factors (CITT and non-CITT) which contributed to the difficulty/error.

Contractor Logistics Support (CLS) and Unit Personnel Interview/Debrief

The CLS and Unit Personnel Interview/Debrief recording forms contain questions to be used during the debriefing of the site and unit personnel who were involved in the Exercise Execution activities. The booklet contains separate sections for the site and unit personnel. The interview/debriefing will probably require 30-60 minutes and should be conducted as a group.

Exercise Execution Observation Form

Exercise Name:_____   **Date:**_____

Difficulty/Error: _____

_____

_____

_____

_____

_____

_____

Contributing factors: _____

_____

_____

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_____

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Difficulty/Error: _____

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Contributing factors: _____

_____

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_____

Guidelines for CCTT Site Personnel Debriefing Session Following Exercise Execution

The debriefing should occur after the Exercise Execution of all exercises has been completed.

The debriefing supplements the data collected during the Exercise Execution observation. The debriefing should be conducted as a group activity using a conversational format; however, the items listed below should be covered. Note: a given item may be more relevant to one group of participants than to others.

1. Follow up each difficulty/error recorded from the Exercise Execution observations. Determine what the Site personnel thought went wrong and whether the problem can be related to CITT (i.e., would the difficulty/error have occurred in any event or did it occur as a result of CITT having been used to develop the exercise and/or train the unit personnel)?

2. Cover the following:

● Have any of the site personnel used the CITT? If Yes, what did they use the CITT for?

● As related to building/proofing the exercises:

1. Did the exercise materials (Plan Sheets, Exercise TSP) include sufficient data on the intent of the exercise?

2. Did the exercise materials (Plan Sheets, Exercise TSP) delivered by the unit include sufficient data to build the exercise initialization file?

3. What specific data/information was needed that was not included in the exercise materials?

● For those site personnel involved in running/supporting/evaluating the exercise (e.g., semi-automated forces [SAF] operators, AAR Team), did the Exercise TSP materials provide sufficient information to support your role in the exercise? If not, what information was missing?

Guidelines for Unit Personnel Debriefing Session Following Exercise Execution

The debriefing should occur after the Exercise Execution of all exercises has been completed (if possible).

The debriefing supplements the data collected during the Exercise Execution observation. The debriefing should be conducted as a group activity using a conversational format; however, the items listed below should be covered. Note: a given item may be more relevant to one group of participants than to others.

1. Follow up each difficulty/error recorded from the Exercise Execution observations. Determine what the unit personnel thought went wrong and whether the problem can be related to CITT (i.e., would the difficulty/error have occurred in any event or did it occur as a result of CITT having been used to develop the exercise and/or train the unit personnel)?

2. Cover the following:

- Did any of the unit personnel use the CITT? If Yes, what did they use the CITT for?
- For each Unit Support Workstation Operator, did they use the CITT to prepare to execute the exercise? If so, how (EDUCCATT, IO, etc.)? Did the preparation they received in CITT adequately prepare them to support the exercises? If not, ask for specific examples of lack of preparation or lack of required knowledge?
- Were any unit personnel involved in building/proofing the exercises at the CCTT site (for those exercises developed using the CITT)? If Yes, did the CITT produced materials provide sufficient data/information to build/proof the exercise?
- (If they used CITT) What, if any, features/functions of the CITT TSP development process were particularly helpful in the execution of the exercises?
- (If they used CITT) What, if any, features/functions of the CITT TSP development process created particular difficulties in the execution of the exercises?

3. For any unit personnel who used CITT to develop exercises:

- Did the exercises as executed adequately match the exercises as "intended" when they were developed in CITT? If not, ask for specific instances or examples of a mismatch. How are the mismatches related to the CITT (e.g., CITT provided incorrect information, insufficient information, etc? Lack of knowledge of the cognitive process for developing structured training exercises)?
- What, if any, features/functions of the CITT TSP development process were particularly helpful in the development of the exercises?
- What, if any, features/functions of the CITT TSP development process created problems in the development of the exercises?
- What would they most like to see added to CITT?
- What could be removed from CITT?

Appendix D
Formative Evaluation Findings from Fort Benning and ANCOC

(To facilitate observation, observers used an aid depicting all CITT activities and a corresponding abbreviation. In the following listing, the abbreviations indicate the specific activity in CITT in which a user was engaged, e.g., CE1 indicates "Create-Exercise Outline-Exercise Tasks and Steps.")

1. The users at Fort Benning wanted to have access to tasks not included in the CITT. Specifically, they are graded on some non-mission essential task list (METL) tasks and/or tasks not included in EUM. They wanted to be able to include those tasks in their exercise.

2. The CEIT tools were not present and could not be loaded under the login the participant was using. As project director reported: 1. The unit had put the machine on the network and had established two domains. They have renamed our administrator account. So, when participant went into PowerPoint under his user account (which does have administrator privileges) no tactical reconnaissance and exploitation demonstration systems (TREDS) (CEIT) tool bars showed up. We tried to install the tool bars with our instructions and got an error that said "PowerPoint found an error that it cannot correct, you should save your presentation and restart PowerPoint." We did this and it still did not work... This is when observers called developers. The unit administrator came and told observer what he had done to the admin account. Tool bars loaded but did not work when we logged on with the new admin account. Only the add-in tools developer wrote worked. We got a Run Time 70 error. 2. At this point developer had observer change the domain from an NT domain to a Workgroup domain. This did nothing; tool bars loaded but did not work. 3. Observer tried to unload the TREDS tools but this did not work either. Finally, observer copied the CITT database and tried to uninstall CITT. The computer said it uninstalled but the database and a number of files were still in the system. Observer manually deleted CITT but could not reinstall it; ran out of memory. Observer defragged the hard drive and installed CITT. Only the CITTSA CD was reinstalled here. This time the tool bars were there and worked but only for the renamed ADMINISTRATOR account. NOTE: uninstalling and reinstalling PowerPoint never did work!!!! Observer tried this earlier.

3. We need to develop Help for CEIT if the team developing it doesn't. In the present CEIT, if the user hits F1, he gets PowerPoint help, not context specific CEIT help.

4. It would be helpful for the user if the CEIT install placed the new toolbars in some logical order and location. For example, observer arranged them on the Benning machine so that they were all arranged on one side of the screen and were in the order they need to be applied. This would help avoid some of the Runtime 5 errors the users encountered.

5. A Jet database error was produced in the Select Mission Tasks.

6. On Create Mission Set Parameters, the training event diagram (TED) should not appear.

7. Participant was never able to get the "Display Contents" in PowerPoint to work.

8. Got a Runtime error when trying to print posterized. This happened one time. The next time, the print posterized worked.

9. After partitioning into three exercises, in CE1, user had all tasks in the drop down list, not just those previously selected in CM.

10. After partitioning, the user went into CE and was completing the exercise outlines for all exercises simultaneously. (This may not be a particularly good way to do it, but it's what he did.) He frequently lost track of which exercise he was currently in. We had to ask him several times if he was aware that he was in exercise 3. Invariably, he wasn't.

11. After completing CE, participant thought he was finished. He had been watching the navigation indicator that shows up on the left side of the screen and all the boxes had turned green. He thought he was finished with create. Thus he closed Create. He had to go into Modify to complete the TSPs.

12. As a direct result of what happened in 11, when participant got to Commo Matrix in Modify, there was none. Users need to be able to go back into Create.

13. We need to deliver CITT with a formalized training process.

14. Participant requested that FM 101-5-1 be included in the available FMs.

15. The CITT needs to have access to the IO from any screen.

16. Navigation issue: There is still confusion in navigating between the use of tabs and the "next" and "previous" buttons. 2.0 will solve this hopefully.

17. It would be helpful if Events could be auto re-numbered when a user adds a new event.

18. At CG3, user wanted to add a new task step. He couldn't. Had to go back to CE1.

19. On the Event Guide, users do not indicate CISs. May go away with the revised CEIT.

20. Users had problems with the current process for printing the TSPs. The CITT needs to be able to print TSPs (or components thereof) without having to go through print preview.

21. Print from the File menu should be disabled.

22. Exercise Outline printed landscape the first time user tried to print it. When we tried to correct it, we got a Dr. Watson error.

23. In CE1, got a "help topic not found error." Need to check all help links.

24. Participant in MT1 and MT2 had difficulty keeping track of which task he was in.

25. In the tutorial or in training, need to clarify that modifying an exercise does not destroy or alter the exercise being modified. We had to convince participant that when he selected the exercise he had previously created to modify, he wasn't going to lose his previous exercise.

26. Is it possible to do spell check in Access? Also to do Find and Replace?

27. In PowerPoint, at one point participant had a very large blank screen with a very small map.

28. Participant liked the fact that he could toggle the map on and off in PowerPoint. He did so frequently allowing him to get a clear view of the overlay itself.

29. There are a number of points in the TSP development process where the user needs to be able to print. For example, after selecting tasks/task steps, user should be able to print the list selected for later use.

30. "Save and Return" does not close Word or PowerPoint.

31. The Task Steps column on the Event Guide is too narrow.

32. Eliminate the "Close" button on the individual forms.

33. User was in PowerPoint working with the TED or the Overlay (happened both ways); minimized PowerPoint so he could work in CITT. When he maximized PowerPoint, the TED or Overlay was gone.

34. User was in Review – PreExercise. Tried to make a change, but couldn't. So he hit "previous" two or three times, navigating backwards, but this produced an error message.

35. In Create, "Complete" should not be the default. Because it is, if the user does not complete his exercise in Create and forgets or otherwise does not uncheck this box, when he goes into modify, it makes another exercise.

36. Need to add task force MTPs.

Appendix E
Formative Evaluation Findings from Fort Hood and ACCC

(To facilitate observation, observers used an aid depicting all CITT activities and a corresponding abbreviation. In the following listing, the abbreviations indicate the specific activity in CITT in which a user was engaged, e.g., CE1 indicates "Create-Exercise Outline-Exercise Tasks and Steps.")

1. The unit had put the CITT machine on their network. When observers arrived, CEIT tools weren't working even for the Administrator. Also, they could not be installed. When they took the machine off the network and tried to restart, the machine died. Turned out to be a hard drive failure.

2. On the laptop–the unit had reinstalled NT and Office; however, they had not installed the assistant. When CITT attempted to load, it failed because it couldn't locate the assistant. We talked about this last week and developer is looking at code to bypass assistant and agent if they are not loaded.

3. On the laptop, the video quality of the demos is poor. The screen is shaky/jumpy.

4. The CITT uninstall does not work.

5. Got Dr. Watson errors on Print Matrix OPORD. This was on the machines as observers found them. So probably related to what the unit had done to the machine. After reloading NT, Office, and CITT, didn't get the message again.

6. In CE1, there is insufficient space in the field to show the entire task step description. Need to increase the size of the field.

7. In CE2, we need to make it clear to the user that he can crop the image again (i.e., He has previously cropped the image when he created the overlay.). Now, when he gets to create TED, he can crop the previously cropped image.

8. In PowerPoint, "regroup" did not work for unit symbols.

9. Got a Visual Basic (VB) error in PowerPoint when the user tried to designate an OPFOR unit.

10. In MC4, user couldn't replace workstations. Also, we don't have intelligence officer and operations and training officer workstations (radios).

11. MX2 – user was not able to complete the activities.

12. Conflict between CITT/CEIT capability for identifying Unit IDs and bumper numbers and CCTT's capability to use these IDs. The CCTT unit topology editor should solve.

13. In ME, sometimes task steps did not appear.

14. In ME, user selected a task step then decided he didn't want it. He could not delete it.

15. In MW2, user had to reenter OPFOR starting locations.

16. Equipment State drop downs on the Plan Sheet do not function properly. This may be obsolete in 2.0, but we need to monitor how it shows up in CEIT.

17. When printing the Plan Sheet, the last row is not printed.

18. On the Plan Sheet, there are two "Remarks" columns.

19. User suggested screening thumbnails by criteria (i.e., He had entered select criteria and had gotten a list of matching exercises.). When he went to look at the thumbnails, he would have preferred if "view all thumbnails" only cycled through the matching exercises, not the whole set of TSPs.

20. There was a problem with the wheel mouse. Text disappeared for no apparent reason.

21. User suggested having an "Add All" button for task steps.

22. In selecting task steps, user wanted the drop down list to return to the last step selected rather than to the beginning of the list.